

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A ~~highspeed~~ medical or dental ~~turbine~~ handpiece including for use with a rotatable tool having a tool shaft for insertion into the handpiece, the tool shaft having a torque lock portion of non-circular cross-section, the handpiece comprising:

a handle portion for gripping by a user[[,]];

a drive head connected with the handle portion and forming a ~~turbine~~ drive housing[[,]];

a ~~turbine~~ drive rotatably supported in the ~~turbine~~ drive housing for rotation about an axis of rotation [[and]], the drive having an axial [[tool]] bore ~~for receiving a shaft of a rotatable tool insertable into the handpiece, and; and~~

~~a pair of axially spaced apart bearings for rotatably supporting the turbine in the turbine housing; characterized in that the handpiece further includes~~

a torque transfer arrangement received in the axial bore of the drive for transferring torque generated by the ~~turbine~~ drive to a tool with a shaft portion having a non-circular cross-section symmetrical to the axis of rotation, the rotatable tool when inserted into the handpiece, the torque transfer arrangement including a ~~locking socket~~ spindle received in the axial bore of the drive and having an axial tool bore for receiving the tool shaft, the spindle being connected to the drive for torque transmission, the spindle further including a tool retaining arrangement for releasably retaining the tool shaft in the axial tool bore against axial movement upon insertion of the tool shaft into the axial tool bore, and a torque lock in the axial tool bore of the spindle independent of the tool retaining arrangement for concentrically receiving the shaft torque lock portion of the tool shaft, the torque lock [[and]] having a complementary non-circular cross-section symmetrical to the axis of rotation for locking complementary to the torque lock portion of the tool shaft ~~portion against rotation in the socket to prevent rotation of the torque lock portion of the tool shaft in the torque lock,~~ while permitting axial insertion of the [[shaft]] torque

lock portion of the tool shaft into the ~~locking socket~~, the ~~locking socket~~ torque lock, the torque lock being connected to the ~~turbine spindle~~ for rotation therewith.

2. (Cancelled)

3. (Currently amended) The handpiece as defined in claim 1, ~~characterized in that the locking socket wherein the torque lock is shaped and constructed for receiving~~ ~~[[a]] the torque lock portion of the tool shaft portion of having a triangular cross-section~~, the ~~locking socket torque lock~~ having a cross-section complementary to that of the ~~[[shaft]] torque lock portion of the tool shaft~~.

4. (Currently amended) The handpiece of claim 1, ~~characterized in that the locking socket is a hollow spindle received in the tool bore and fastened therein~~, the spindle having wherein the torque lock has a cylindrical bore for receiving the ~~[[shaft]] torque lock portion of the tool shaft~~ and having a torque transfer member, the torque transfer member being a protrusion extending radially inwardly into the cylindrical bore for locking the ~~[[shaft]] torque lock portion of the tool shaft in the spindle against rotation~~, while permitting axial insertion of the torque lock ~~[[shaft]] portion of the tool shaft into the locking socket torque lock~~.

5. (Currently amended) The handpiece of claim 4, wherein a surface of the ~~protrusion torque transfer member~~ which engages the ~~[[shaft]] torque lock portion of the tool shaft during insertion of the tool shaft into the axial tool bore of the spindle~~ has a rounded shape for automatically directing the ~~[[shaft]] torque lock portion past the protrusion torque transfer member to achieve a self-alignment of the~~ ~~[[shaft]] torque lock portion in the locking socket torque lock during insertion of the tool shaft~~.

6. (Currently amended) The handpiece of claim 4, ~~characterized in that the handpiece further includes a burr retaining arrangement for releasably retaining the tool in the tool bore against axial movement after complete insertion of the tool into the bore~~, wherein the ~~[[burr]] tool retaining arrangement including includes a pair of complementary, interengaging elements respectively incorporated into the spindle and the tool shaft~~.

7. (Currently amended) A torque transfer arrangement for a highspeed medical or dental handpiece having a turbine drive for rotatably driving a burr about an axis of rotation, the burr having a burr shaft with a [[shaft]] torque lock portion ~~having a non-circular cross-section symmetrical to the axis of rotation~~ and the turbine drive having an axial [[tool]] bore for ~~receiving the burr shaft~~, the torque transfer arrangement ~~being characterized in that it includes a locking socket with comprising:~~

a spindle received in the axial bore of the drive and having an axial tool bore for receiving the shaft portion of the burr shaft, the locking socket spindle being connectable with the turbine drive for rotation therewith; and a torque transfer member connected with the locking socket, the torque transfer member having a cross-section complementary to the shaft portion and symmetrical to the axis of rotation for locking the shaft portion against rotation relative to the locking socket torque transmission, the spindle further including a burr retaining arrangement for releasably retaining the burr shaft in the axial tool bore against axial movement upon insertion of the burr shaft into the axial tool bore; and

a torque lock in the axial tool bore of the spindle independent of the burr retaining arrangement for receiving the torque lock portion of the burr shaft, the torque lock having a non-circular cross-section complementary to the torque lock portion of the burr shaft to prevent rotation of the burr shaft in the torque lock while permitting axial insertion of the torque lock portion of the burr shaft into the torque lock, the torque lock being connected to the spindle for rotation therewith.

8-10. (Cancelled)

11. (Currently amended) The torque transfer arrangement of claim 7, ~~characterized in that the locking socket~~ wherein the cross-section of the torque lock portion of the burr shaft is has a cross-section complementary to a shaft portion of triangular and the cross-section of the torque lock is complementary thereto.

12. (Currently amended) The torque transfer arrangement of claim 7, ~~characterized in that~~ wherein the locking torque lock portion of the burr shaft is a terminal portion of the burr shaft and the ~~locking socket is a hollow spindle having~~ torque lock has a cylindrical bore for receiving

the torque lock portion of the burr shaft, ~~the torque transfer member being a protrusion extending~~
and a torque transfer member protruding radially inwardly into the cylindrical bore for
preventing rotation of the ~~locking torque lock~~ portion of the burr shaft in relation to the spindle
while permitting axial insertion of the burr shaft into the spindle.

13. (Currently amended) The torque transfer arrangement of claim 12, ~~characterized in that~~
wherein end surfaces of the ~~protrusion torque transfer member~~ and the terminal portion of the
burr shaft which come into mutual contact during insertion of the burr shaft into the spindle
torque transfer arrangement have a rounded shape for directing the end surface of the terminal
portion of the burr shaft past the ~~protrusion torque transfer member~~ to achieve a self-alignment
of the terminal portion of the burr shaft relative to the ~~protrusion torque transfer member~~ during
insertion of the burr shaft.

14. (Currently amended) The torque transfer arrangement of claim 12, ~~characterized in that~~
~~the spindle further includes a burr retaining element extending into the cylindrical bore for~~
~~releasably engaging a complementary retaining element on the burr shaft to releasably lock the~~
~~burr shaft in the cylindrical bore against axial movement wherein the burr retaining arrangement~~
includes a pair of complementary, interengaging elements respectively incorporated into the
spindle and the burr shaft.

15. (Withdrawn) A medical or dental turbine handpiece for a rotatable tool, having a handle
portion for gripping by a user, a drive head connected with the handle portion and forming a
turbine housing, a turbine in the turbine housing for rotatably driving the tool about an axis of
rotation and having an axial tool bore for receiving the shaft of the tool, a pair of axially spaced
apart bearings for rotatably supporting the turbine in the turbine housing, and a pressurized drive
air conduit for supplying pressurized turbine drive air to the turbine, characterized in that the
bearings are air bearings, and that the handpiece includes a bearing air conduit for supplying
pressurized bearing air to the air bearings independent of the turbine drive air.

16. (Withdrawn) The handpiece of claim 15, characterized in that it further includes a
controller for controlling a flow of the pressurized drive air through the drive air conduit separate
and independent from a flow of the bearing air through the bearing air conduit.

17. (Withdrawn) A method of operating a dental handpiece including an air turbine driven by pressurized drive air and a pair of air bearings for supporting the air turbine in the handpiece and operated by pressurized bearing air, characterized by the steps of supplying pressurized bearing air to the air bearings, and supplying pressurized drive air to the turbine independent of the bearing air, the step of supplying bearing air being commenced prior to supplying drive air and continued at least as long as the step of supplying drive air.

18. (Withdrawn) A medical or dental turbine handpiece for a rotatable tool, having a handle portion for gripping by a user, a drive head connected with the handle portion and forming a turbine housing, a turbine in the turbine housing for rotatably driving the tool about an axis of rotation and having an axial tool fore for receiving the tool, and a pressurized turbine drive air supply conduit, characterized in that the drive head includes a turbine drive air supply chamber connected to the drive air supply conduit for receiving drive air, and that the supply chamber extends about the turbine chamber for supplying turbine drive air to the turbine at least at two spaced apart locations distributed about the axis of rotation.

19. (Withdrawn) The handpiece of claim 18, characterized in that the turbine drive air supply chamber is an annular chamber extending concentrically about the axis of rotation.

20. (Withdrawn) The handpiece of claim 19, characterized in that the supply chamber supplies drive air to the turbine at a multitude of locations evenly distributed about the axis of rotation.

21. (Withdrawn) The handpiece of claim 18, characterized in that the drive head further includes a Venturi passage connecting the drive air supply chamber to the turbine chamber for accelerating the drive air prior to impinging on the turbine.

22. (Withdrawn) The handpiece of claim 21, wherein the Venturi passage includes multiple air guide vanes for directing the turbine drive air onto the turbine in a direction generally radially inwardly towards the axis of rotation.

23. (Withdrawn) A medical or dental turbine handpiece for a rotatable tool having a handle portion for gripping by a user, a drive head connected with the handle portion and forming a

turbine housing, a turbine in the turbine housing for rotatably driving the tool about an axis of rotation and having an axial tool bore for receiving a shaft of the tool; and a pair of axially spaced apart bearings for rotatably supporting the turbine in the turbine chamber for rotation about the axis of rotation, characterized in that the bearings are air bearings.

24. (Withdrawn) The handpiece of claim 23, characterized in that each air bearing includes a bearing stator having the shape of a spherical section and a bearing rotor of complementary shape, and that the bearing rotor and stator are shaped to define an intermediate bearing gap of even width throughout.

25. (Withdrawn) A medical or dental turbine handpiece having a handle for gripping by a user, a drive head attached to the handle and forming a turbine chamber, an air driven turbine in the turbine chamber for rotatably driving a tool, the turbine being operated by turbine drive air, and a swivel connector for rotatably connecting the handle to an umbilical cord including at least a supply conduit for the turbine drive air, characterized in that the swivel connector has an angled connector body for connecting the handle and the umbilical cord at an angle of less than 180 degrees to reduce user wrist strain.

26. (Withdrawn) The handpiece of claim 25, characterized in that the handle and the umbilical cord are connected at an angle between 90 and 180 degrees.

27. (Withdrawn) A medical or dental turbine handpiece for a rotatable tool having a shaft including a drive head for rotatably supporting the tool and forming a turbine housing, a turbine in the turbine housing for rotatably driving the tool about an axis of rotation, a pair of axially spaced apart bearings for rotatably supporting the turbine in the turbine housing, a pressurized drive air conduit connected to the turbine housing for supplying pressurized turbine drive air to the turbine, and an exhaust conduit connected to the turbine housing for removing spent turbine drive air from the turbine housing, characterized in that the handpiece further includes a shut-off valve for reducing turbine run down time when the supply of turbine drive air is stopped, that the shut-off valve is connected to the drive air conduit and the exhaust air conduit and that the shut-off valve includes a closure member normally biased into a closed position wherein the closure member closes both the drive air and exhaust conduits and movable by drive air pressure to an

open position wherein the closure member permits passage of drive air and exhaust air through the drive air and exhaust conduits respectively.

28. (Withdrawn) The handpiece of claim 27, characterized in that the bearings are air bearings, that the handpiece further includes a bearing air supply conduit connected to the drive head for supplying pressurized bearing air to the air bearings, and that the supply conduit supplies the bearing air independent of the position of the closure member of the shut-off valve.

29. (Withdrawn) The handpiece of claim 28, characterized in that the shut-off valve is incorporated into the handle portion and that the closure member is a sleeve axially movable in the handle portion between the open and closed positions.

30. (Withdrawn) A medical or dental turbine handpiece for a rotatable tool having a working tip, the handpiece including a handle portion for gripping by a user, a drive head connected with the handle portion by an intermediate neck portion, the drive head forming a turbine housing, a turbine in the turbine housing for rotatably driving the tool about an axis of rotation and having an axial tool bore for receiving the shaft of the tool, and a pair of axially spaced apart bearings for rotatably supporting the turbine in the turbine housing, characterized in that the handle portion has a longitudinal central first axis and the neck portion has a longitudinal central second axis, that the drive head, neck portion and handle portion being interconnected in such a way that an angle enclosed by the axis of rotation of the tool with the first axis is larger than 90 degrees, and with the second axis is less than 90 degrees, and that the second axis is oriented at an angle to the first axis such that the tool tip coincides with the first axis.

31. (Withdrawn) A medical or dental turbine handpiece for a rotatable tool, including a handle portion for gripping by a user, a drive head forming a turbine housing, an intermediate neck portion connecting the drive head with the handle portion, a turbine in the turbine housing for rotatably driving the tool about an axis of rotation and having an axial tool bore for receiving the shaft of the tool, and a pair of axially spaced apart bearings for rotatably supporting the turbine in the turbine housing, characterized in that the handpiece further includes a neck connecting arrangement for releasably connecting the neck portion to the handle portion, that the neck connecting arrangement includes a socket portion on one of the neck portion and the handle

portion and a plug portion on the other of the neck portion and handle portion, and that the plug and socket portions are of complementary shape for non-rotatably connecting the neck and handle portions.

32. (Withdrawn) The handpiece of claim 31, characterized in that the neck connecting arrangement further includes a snap lock for releasably locking the plug portion in the socket portion.

33-34. (Cancelled)

35. (New) The handpiece as defined in claim 1, wherein the torque lock has a torque transfer member extending radially inwardly into the axial tool bore of the spindle for engagement of the torque lock portion of the tool shaft.

36. (New) A medical or dental handpiece for use with a rotatable tool having a tool shaft for insertion into the handpiece, the tool shaft having a torque lock portion of non-circular cross-section, the handpiece comprising:

- a handle portion for gripping by a user;

- a drive head connected with the handle portion and forming a drive housing;

- a drive rotatably supported in the drive housing for rotation about an axis of rotation, the drive having an axial bore; and

- a torque transfer arrangement received in the axial bore of the drive for transferring torque generated by the drive to the rotatable tool when inserted into the handpiece, the torque transfer arrangement including a spindle received in the axial bore of the drive and having an axial tool bore for receiving the tool shaft, the spindle being connected to the drive for torque transmission, the spindle further including a tool retaining arrangement for releasably retaining the rotatable tool in the axial tool bore against axial movement upon insertion of the tool shaft into the axial tool bore, wherein the tool retaining arrangement includes a pair of complementary, interengaging elements respectively incorporated into the spindle and the tool shaft, and a torque lock in the axial tool bore of the spindle independent of the tool retaining arrangement for

concentrically receiving the torque lock portion of the tool shaft, the torque lock having a non-circular cross-section complementary to the torque lock portion of the tool shaft to prevent rotation of the torque lock portion of the tool shaft in the torque lock, while permitting axial insertion of the torque lock portion of the tool shaft into the torque lock, the torque lock being connected to the spindle for rotation therewith.

37. (New) The handpiece as defined in claim 1 or 36, wherein the drive is part of a drive unit including a turbine, a pair of axially spaced apart bearings for rotatably supporting the turbine in the drive housing and a chuck, the chuck including the spindle, the tool retaining arrangement and the torque lock.

38. (New) A medical or dental handpiece for use with a rotatable tool having a tool shaft for insertion into the handpiece, the tool shaft having a torque lock portion of non-circular cross-section, the handpiece comprising:

a handle portion for gripping by a user;

a drive head connected with the handle portion and forming a drive unit housing; and

a drive unit rotatably supported in the drive unit housing for rotation about an axis of rotation, the drive unit including a chuck for receiving the rotatable tool and providing a torque transfer arrangement for transferring torque generated by the drive unit to the rotatable tool when inserted into the handpiece, the chuck including a spindle having an axial tool bore for receiving the tool shaft and a tool retaining arrangement for releasably and frictionally retaining the rotatable tool in the axial tool bore against axial movement upon insertion of the tool shaft into the axial tool bore and a torque lock in the axial tool bore of the spindle independent of the tool retaining arrangement for concentrically receiving the torque lock portion of the tool shaft, the torque lock having a non-circular cross-section complementary to the torque lock portion of the tool shaft to prevent rotation of the torque lock portion of the tool shaft in the torque lock, while permitting axial insertion of the torque lock portion of the tool shaft into the torque lock, the torque lock being connected to the spindle for rotation therewith.

39. (New) The handpiece of claim 38, wherein the drive unit further includes a turbine and a pair of bearings for rotatably supporting the turbine in the drive unit housing, the turbine having an axial bore and the spindle being received in the axial bore of the turbine and connected to the turbine for torque transmission.